Town of Milton, Delaware

Study for Sea Level Rise and Public Facilities Asset Risk

Adaptation Planning

Prepared by:

Pennoni

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1. Introduction

The Town of Milton has retained Pennoni to review various conditions affecting flooding in Milton and to consider the various inputs which may impact flood elevations in combination. The funding for the limited study is from a grant provided by Delaware Department of Natural Resources and Environmental Control (DNREC). This document will serve to satisfy Task 1 Data Collection and Risk Assessment requirements for the 2015 Coastal Management Assistance Grant as awarded to the Town of Milton by DNREC. The goal of this study will be to identify at-risk public assets by type of flooding event, evaluate zoning and building codes, and recommend strategies to accommodate, mitigate, abandon, or armor the public facility.

Figure 1: Historic Town Center, Mill Pond and River

2. Background: History, Character and Flooding Events

Milton is located in Sussex County, the southernmost County in the State and has its historic roots embedded at the headwaters of the tidal reach of the Broadkill River. The settlement was initially founded in 1763 with the town flourishing in the 18th century and reached status as an incorporated town in 1863. In 2014, the town has an approximate population of 2800 and approximately 1340 homes situated within a 1.63 square mile area straddling the River.

The Broadkill River is central to the identity, history, character and economic wellbeing of the Town of Milton. Milton's protected inland location provided security from ocean storms and it was secure from the pirate and foreign naval attacks that plagued the bay-front towns in the early centuries, making it ideal for industry to flourish. In later years, access to sources of lumber and locally-raised farm products made the port central to the developing and prosperous shipping community. The river facilitated the development of several mills, resulting in streams being impounded to create the millponds.

Today, the Broadkill River continues to be considered one of the Town's greatest assets along with its Historic District and its traditional downtown. Currently, that relationship with the River can be symbolized by its Memorial Park. The park includes a boat ramp and six boat slips, as well as open space, a playground, bandstand and miniature train coupled with many of the town's ongoing traditional gatherings, including concerts, annual Festivals, and water activities.

Figure 2 Milton Memorial Park

While considered Milton's greatest natural asset, the Broadkill River poses a significant threat and challenge to the area adjacent to the river. Throughout its history, Milton's Town Center has been subjected to frequent flooding by the Broadkill River, as a result of hurricane storm surges that push water up the river from the Delaware Bay to the east and inundation of the Wagamon's watershed after heavy rainfall from the west. Wagamon's Pond, a millpond created in 1915, impounds water from a 45 square mile watershed and frequently overflows due to severe rainfall. The flooding events have inundated downtown Milton with varying degrees of severity over the years.

There are two impoundment areas on the Broadkill River. These are known as Wagamon's Pond at the intersection of Wagamon's Branch and Ingram Branch. The other impoundment area, Diamond Pond is located on Ingram Branch upstream of Sand Hill Road and is technically outside of the town limit.

The Broadkill River is tidal up to the embankment for Wagamon's Pond. Tides clearly impact the extent and severity of flooding in Milton. Storm surges result from tropical depressions, hurricanes, mostly coming up the coastline or Nor'easters which are cold-core Mid-Atlantic storms. These storms usually

take a north or northeastward track following their development, intensifying along the way due to the temperature difference between the cold Arctic air transported across the U.S. by the polar jet and the warm air moving northward from the Gulf of Mexico and Atlantic Ocean. The counter-clockwise flow around this low pressure system brings the warm moist oceanic air over land.

One of the worst storms to impact the Town of Milton was a Nor'easter in 1962. Heavy rainfall which generally accompanies hurricanes and Nor'easters over the drainage area would increase the incidence of flooding.

The land area that drains to the intersection of Broadkill River and Round Pole Branch is estimated to be approximately 45 square miles as documented in Federal Emergency Management Agency (FEMA) records. Quantity of runoff from the drainage area for the 10 year storm is estimated at 576 cubic feet per second (CFS) as per FEMA records, with a 50-year flow rate is 991 CFS and 1213 CFS for the 100-year storm event.

The intensity and frequency of flooding are expected to increase in the future due to projected sea level rises and increased severity of storms. As part of Task 1, Risk Maps reflecting various scenario events have been developed and area included with this report.

As the River, the Town Center, and the Historic District of Milton are bound together through history and design, it is critical that all planning efforts, site design, building design, and location of future infrastructure and utilities take into account the River's regional drainage functions and its connection to Delaware Bay coupled with the influence of storm events.

The Town Center is also the location of much of the Town's utility infrastructure investment, management of daily operations, and public safety/emergency management response. Thus recurring flooding impacts have an extremely detrimental influence on funding, maintaining, and replacing vital components of the Town's operation.

3. Existing Conditions and Risk Assessment

The existing facilities within the Town of Milton limits that are adjacent to the river consist of a number of public facilities that are funded and maintained by the Town, County, State and/or private utility. These facilities range from shoreline centric parks, boat launches, cultural facilities, public schools, to potable water, wastewater treatment, public safety/emergency response and daily governance.

The enclosed mapping identifies that under various scenario events, much of the area that housed the boat builders and merchant shipping areas has been converted to open space including Memorial Park and paved parking areas. For instance, the mapping shows that, during the Category 4 Storm flood area, there are a number of public facilities, including the Wastewater Treatment facility and potable water production wells no. 2, 3, 4, and 5 (*all existing well locations*). Public operations charged with response to such events including the Public Works building, the Milton Volunteer Fire Company No. 85 and Police Station could both be at risk. Furthermore, while the fire station is at risk during a severe storm, the event would also imperil response times by eliminating routes available to the responders as the fire protection equipment would be cut off from the north side of town since the bridges would be overtopped by the water making them impassable. Public parking, a modern necessity for businesses in the Town Center, is also located within the area impacted by flooding. Other municipal property is generally located outside of the floodplain with little risk of flooding.

In addition to public properties, equipment and operations impacted by larger scale flooding events, there are several privately owned properties including business and residential dwellings that are at

risk to flooding. These are located along Union Street, Front Street, Mulberry Street and numerous adjacent minor and side streets. Please note these areas on the attached mapping.

While the above identified critical infrastructure are described to be a concern during a Category 4 Storm, a similar concern related to sea-level rise exists. Based on the prepared Flood Risk Adaptation Map (FRAM), one should notice that the predictions of this map, communicate a similar picture to that of a Category 3 or 4 Storm event. Understanding sea-level rise and picturing the impacts may be harder to recognize until you compare the levels to that of these storm events.

4. Methodology

The methodology adopted for the limited study required the sourcing of data and maps for Milton that would provide suitable data with respect to flooding in Milton. Maps and data considered suitable LiDAR base mapping including digital elevation inventory maps, FEMA Flood Insurance Rate Map Panels, Floodplain Maps, Sea Level Rise Maps, Flood Risk Maps and Storm Surge Maps for various categories of storm.

The data and maps were obtained from FEMA, DNREC, National Oceanic and Atmospheric Administration (NOAA), United States Geologic Service (USGS), Delaware Coastal Programs and Delaware "FirstMap", as well as the Town of Milton and Sussex County.

Maps were electronically overlaid the establish relationship between elevations on the various maps. Flooding events that could be considered as being cumulative were considered as such and used to develop data to establish revised flood elevation impacts. Various scenarios will be developed and evaluated and depicted on the flood risk map for variable events such as sea level rise of predetermined rise in elevation or selected categories of hurricane intensities.

The risk maps generated will be presented to the Town of Milton for review and comment including establishing the acceptable risk map that will be used by the town as a land planning tool and use guide for future development. The flood risk map will be developed in conjunction with the Sussex County program that is currently underway to develop flood risk maps for communities located in the County.

Real Estate assets belonging to the Town, State and Federal assets have been identified and depicted on the maps. In the next Task, flood risk associated with the assets will be evaluated and documented. The Town will have the responsibility of making any decisions concerning planning, capital programming, operational budgets, zoning code and building code impacts for property identified as being at a high risk of recurring flooding during the life of the asset.

Not only will the existing assets be evaluated, but future critical infrastructure and utilities shall also be acknowledged and planned according to the accepted risk maps.

5. Findings and Conclusions

The various maps obtained from FEMA, NOAA, USGS, DNREC, and Delaware Coastal maps were used to develop the flood risk map that could result due to simultaneous events and coupled with anticipated sea rise elevations resulting from climate change. The level of flooding depicted on the flood risk map can be considered as being a worst case scenario as developed using available data.

The net result is that anticipated sea level rise coupled with a Category 4 hurricane storm and high tides would result in a worst case scenario logically raise flood elevations to those depicted on the Flood Risk Assessment Map (FRAM).

The following table lists the sixteen (16) identified public facilities and critical infrastructure within the Town and potential impact to each of those based on flood zone as identified by the FEMA Floodplain Map, Storm Surge indication for each of four categories of storm (Cat1, Cat2, Cat 3, and Cat4), Sea Level Rise, and a Flood Rise Adaption Map (FRAM).

			Asset Impact Risk						
Ref No.	Facility	Function	Storm Events				Sea Lvl Rise		FRAM
			Cat 1	Cat 2	Cat 3	Cat 4	0.5 M	1.5 M	
1	Well 5	Potable Water Source		YES	YES	YES		YES	YES
2	WWTP	Waste Water Treatment		YES	YES	YES		YES	YES
3	Tower No. 1	Water Storage Tower				YES			YES
4	Wells 2,3,4	Wells & Treatment Plant				YES	YES	YES	YES
5	Tower No. 2	Water Storage Tower							
6	DPW Building	Public Works Operations		YES	YES	YES	YES	YES	YES
7	Parking Lot	Municiple Parking Lot		YES	YES	YES	YES	YES	YES
8	Memorial Park	Public Park		YES	YES	YES	YES	YES	YES
9	Police Station	Milton Police Headquarters		YES	YES	YES			
10	Town Hall	Town Services							
11	Town Parcel	Town owned parcel		YES	YES	YES	YES	YES	YES
12	Fire Dept	Milton VFD Co 85 EMS/Fire			YES	YES		YES	YES
13	Milton ES	Elementary School							
14	HO Brittingham ES	Elementary School							
15	Mariner MS	Middle School							
16	Post Office	US Postal Service							
	Facilities at Risk			7	8	10	5-0.5/8-1		9

Table 1 Facilities Assessment Impact Risk

6. Evaluation for Resiliency Improvements to Building and Zoning Codes

Development occurring within the Town of Milton is regulated by Zoning and Building Codes as most of the development opportunity located within the Town Center is in-fill type in nature. Much of the properties located within the Historic District as well as the Town Center predate the Town's adoption of the Zoning Code (Chapter 220).

Prior to the completion of the *1985 Town of Milton Comprehensive Plan*, zoning within the Town area was governed by the Sussex County Zoning Ordinance and map. The first Town of Milton Zoning Ordinance was adopted in 1987 following the adoption of the Comprehensive Plan.

The Town Zoning Map was first included as part of the Town of Milton *1997 Community Information Guide*. As of 2015 the current Milton Zoning Ordinance (Chapter 220. Zoning) includes nine districts (including a Historic Preservation Overlay District), found on the Town's Official Zoning Map. Review of the Official Zoning Map against Storm and Sea Level Rise Mapping indicates that the following zoning districts have been applied against parcels located within the estimated impact area created by various storm scenarios:

R-1 Single-Family Residential Use

The intent of the R-1 Single-Family Residential Use District is to delineate areas where predominately single-family detached, low-density residential development has occurred or is desired and likely to occur. The R-1 District recognizes the value of such other permissible uses as churches, schools, libraries and other educational buildings and playgrounds.

R-2 Single-Family Residential Use

The intent of the R-2 Single-Family Residential Use District is to delineate areas for the development of detached or attached single-family residential uses at densities similar to that of the R-1 Use District, but with the ability to utilize design and planning concepts to create a planned and desirable residential living environment while protecting existing and future uses.

T-C Town Center Use District

The intent of the T-C Town Center Use District is to delineate the Town Center area which is historic and pedestrian in scale and is predominately utilized and is appropriate for a more intensive and traditional mixture of interactive retail, cultural, conference and meeting, lodging, business and personal service, financial, institutional, office, residential and governmental uses and to provide and promote a full range of Town Center uses that serve the needs of the surrounding town and county populations and to ensure that a permitted use is compatible with the character of the district and its permitted types and intensities of use. The purpose of the T-C District is also to recognize the unique historic character of the Town Center as part of the heritage of the Town of Milton and Sussex County.

M-R Marine Resources Use District

The intent of the Marine Resources Use District established in this section is to recognize the unique role which the Broadkill River and its waterfront areas have played in the formation, growth and life of the Town of Milton. The District has five objectives which provide for a compatible mixture of waterfront-related uses, encourage appropriate land development including adaptive reuse, recognize the sensitivity of the unique waterfront environment and reinforce safeguards to protect area and the resource, protect scenic views of the river and encourage public access to the river.

LPD Large Parcel Development District

The intent of this District is to develop new and redevelop older neighborhoods that reflect the urban design and scale of the Town of Milton. The LPD District provides for design ingenuity while protecting existing and future developments. In order to encourage large-scale developments as a means of creating a superior living environment, the LPD District encourages development to connect with the special and historic relationship of the Town, create a diversity of housing types and mixture, promote human and town scale and neighborhood interaction, and limit the intensity of business, commercial and institutional uses.

HP-OD Historic Preservation Overlay District

The intent of this Overlay District is to identify the Town's Historic District and to acknowledge and strengthen the heritage and economic-well-being of the Town by preserving its architectural and historic resources, conserving property values, fostering architectural and historic character, strengthening the local economy, and promoting use and vitality of the Historic District by designating it. By adopting this Overlay District, the Town will permit the principal, accessory and special permitted uses established in the underlying zone provided that the use is approved by the Historic Preservation Commission.

Of the nine present zoning districts within the Town of Milton, six districts permit various residential and commercial uses that are located within flood prone areas and required further evaluation. Also of important note, all of these zoning districts permit "Government Uses" by right. Thus, during the risk assessment, the Zoning Code was evaluated to identify sections of the code that apply to the areas of Milton subjected to repeated flooding to various degrees of severity. After review, it was noticed that the Town of Milton previously added Section 125 – Floodplain Management which included language to protect property owners by regulating development within the flood prone areas and protecting existing Town infrastructure. Although this section of the code provided direction regarding construction of structures, it needed to be updated to address construction of utilities.

The text used here in no way supplants or replaces Article 220 of the Town of Milton. For more information about the Zoning Ordinance, please refer to the appropriate Chapters and Sections of Article 220.

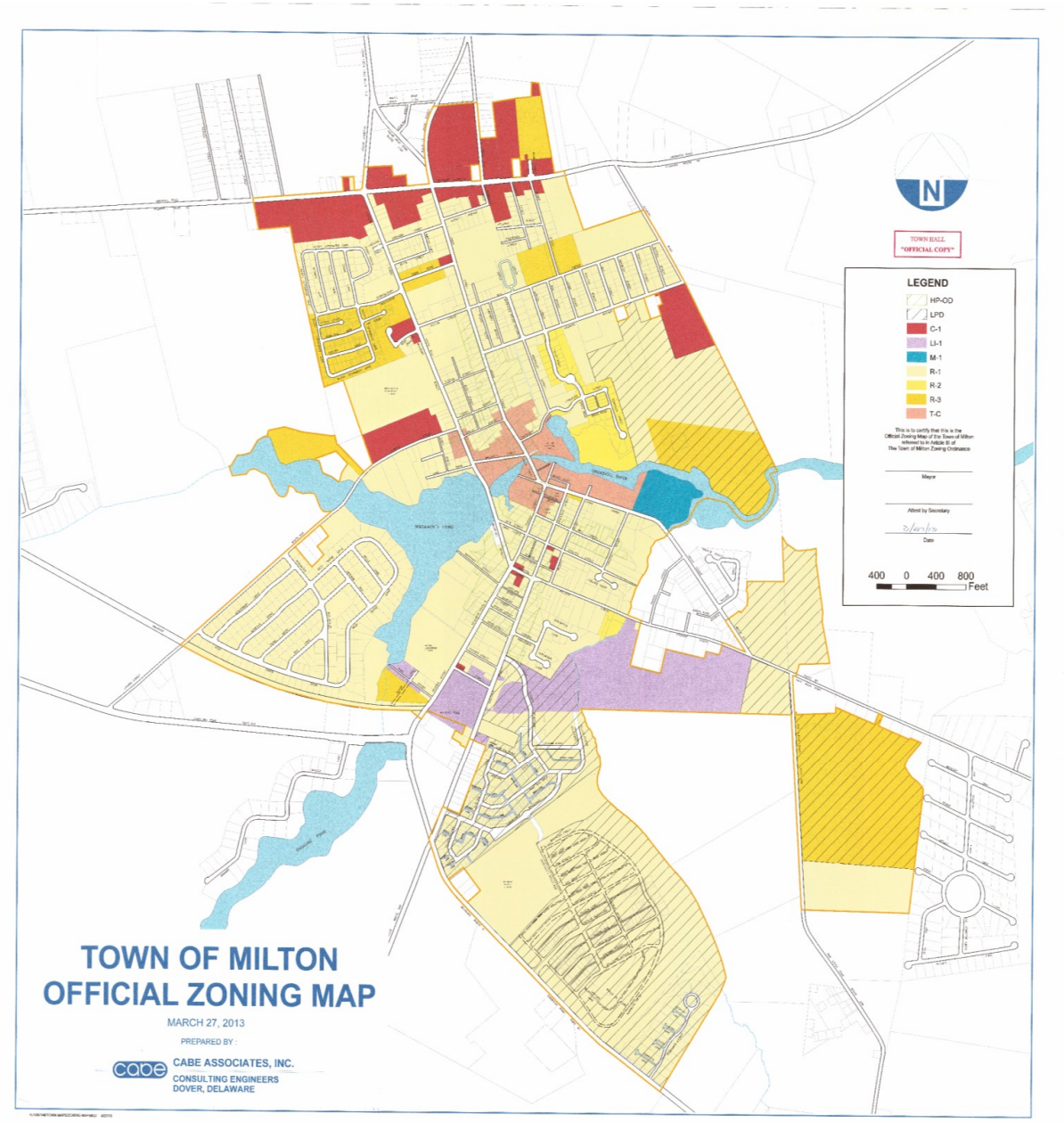

Figure 3 Town Zoning Map

(Official Map can be found in Town Hall)

7. Task 2 – Evaluation and Recommendations for Resiliency Improvements to Building and Zoning Code

Task 2 has been completed and have recommended an amendment to the Floodplain Management Section 125 of the Code. A copy of this amendment has been included as an attachment to the report.

8. Task 3 – Stakeholder and Public Engagement

Task 3 of the Grant required the Town to hold a public meeting and workshop at which it presented the methods and findings of the risk assessment and the recommended change to Section 125 Floodplain Management. The hearing and workshop were held on March 30, 2016 in the Town Library at 121 Union Street, Milton, DE. Notice of the meeting is provided as an attachment to this report.

The following is a synopsis of the meeting and workshop.

A public meeting to present the results of the Delaware Coastal Management Assistance Grant finding and potential proposed Code revisions was held on March 30, 2016 at 6:30 pm in the Milton Public Library. The meeting was duly noticed and publically advertised as required by Town of Milton Code.

The meeting convened at 6:30 pm with a brief introduction by John Collier, Project Coordinator. A presentation outlining the scope of the study and it findings was given by Mr. Carlton Savage, Consultant Engineer, Pennoni Associates with assistance from Mr. Cardwell and Mr. Lake also of Pennoni Associates and John Collier, Town of Milton.

After allowing the meeting attendees the opportunity to examine large maps outlining various scenarios of sea level rise and climatic change and their impacts, a presentation was given outlining the scope of the study and the findings. Also presented were concepts of potential changes to Town of Milton Code.

At the conclusion of the presentation the floor was opened to questions concerns and comments. Generally the presentation was well received and the consensus was it was very informative.

Public comment varied in its diversity. The general feeling was this study was important and revealed valuable information. There was a large concern from the audience regarding the Wagamon's Pond watershed and how when combined with projected sea level rise and climatic changes would it impact flood prone areas within the Town of Milton. A number of mitigation ideas were offered from the attendees, some in the form of Code revision and others ranging from immediate relocation of potentially impacted infrastructure to the erection of a dam several miles beyond the current Town borders to regulate upstream flooding.

The consensus of the attendees was the proposed changes to the Floodplain Management Code would be the most effective for the immediate as well as the long term.

The meeting adjourned at 8:35 pm

9. Next Steps:

While evaluation of the risk to public assets was the purpose of this study, and informed understanding and documenting of risks to other public and private properties along the Broadkill River and its tributaries is necessary. The Town is currently updating its Comprehensive Plan and in doing this it is identifying parcels along the River and its tributaries which will be located within its Future Growth Area when annexation is possible under Delaware Code. Development of both public access to the River and private development along the River should be guided by findings from further study. The Town will likely seek funding from DNREC and/or other sources to conduct the necessary studies to determine the extent of risk.

10. Conclusion

The Town of Milton conducted a Flood Risk Assessment using the methodology described above. The Risk Assessment found that several of the Town's structures involving delivery of potable water, treatment of sanitary sewer, Town Administration and Town Emergency Response would be impacted by a combination of Sea Level Rise and a Category 4 Storm Event. The Town evaluated its development codes involving zoning and found that it would be appropriate to recommend changes to its Floodplain Management requirements which is Section 125 of the Town Code, specifically in terms of utility facility location which reinforces the Town's finding from the risk assessment that its greatest challenge is the protection of its utility assets.

Appendices

1. FEMA Floodplain Map
2. Storm Surge Inundation Map—Category 1 Storm
3. Storm Surge Inundation Map—Category 2 Storm
4. Storm Surge Inundation Map—Category 3 Storm
5. Storm Surge Inundation Map—Category 4 Storm
6. Sea Level Rise Scenario Map
7. Flood Risk Adaption Map (FRAM)
8. LiDAR Contours Map
9. LiDAR Digital Elevation Model (0-40 Range)

Additional Attachments

1. Notice of Workshop
2. Recommended Code Amendment – Chapter 125 Floodplain Management